



Did You Know?

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NASA Earthquake Forecast Has Amazing Success Rate

An ESTO-funded earthquake prediction program has an amazing track record. Published in 2002, the Rundle-Tiampo Forecast has accurately predicted the locations of 15 of California's 16 largest earthquakes this decade, including last week's tremors. The 10-year forecast was developed by researchers at the University of California Davis and from the QuakeSim Project at NASA's Jet Propulsion Laboratory.

"We're elated our computer modeling technique has revealed a relationship between past and future earthquake locations," said Dr. John Rundle, director of the Computational Science and Engineering initiative at the U.C. Davis. He leads the group that developed the forecast scorecard. "We're nearly batting a thousand, and that's a powerful validation of the promise this forecasting technique holds," he said.

Of 16 earthquakes, magnitude 5 and higher since Jan. 1, 2000, 15 fall on "hotspots" identified by the forecasting approach. Eleven of the 15 quakes occurred after the paper was published in Proceedings of the National Academy of Sciences in Feb. 2002. The scorecard uses records of earthquakes from 1932 onwards to predict locations most likely to have quakes of magnitude 5 or greater between 2000 and 2010. According to Rundle, small earthquakes of magnitude 3 and above may indicate stress is building up along a fault. While activity continues on most faults, some of those faults will show increasing numbers of small quakes, building up to a big quake, while some faults will appear to shut down. Both effects may herald the possible occurrence of large events.

The scorecard is one component of NASA's QuakeSim project. "QuakeSim seeks to develop tools for quake forecasting. It integrates high-precision, space-based measurements from global positioning system satellites and interferometric synthetic aperture radar (InSAR) with numerical simulations and pattern recognition techniques," said Andrea Donnellan, QuakeSim principal investigator. "It includes historical data, geological information and satellite data to make updated forecasts of quakes, similar to a weather forecast," she said.

The scorecard forecast generated a map of California from the San Francisco Bay area to the Mexican border, divided into approximately 4,000 boxes, or "tiles." For each tile, researchers calculated the seismic potential and assigned color-coding to show the areas most likely to experience quakes over a 10-year period.

So far, the technique has only missed one earthquake, a magnitude of 5.2, on June 15, 2004, under the ocean near San Clemente Island. Rundle believes this "miss" may be due to larger uncertainties in locating earthquakes in this offshore region of the state. San Clemente Island is at the edge of the coverage area for Southern California's seismograph network. Rundle and Holliday are working to refine the method and find new ways to visualize the data.

Other forecast collaborators include Kristy Tiampo, the University of Western Ontario, Canada; William Klein of Boston University, Boston; and Jorge S. Sa Martins, at the Universidad Federal Fluminense, Rio de Janeiro, Brazil.

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